

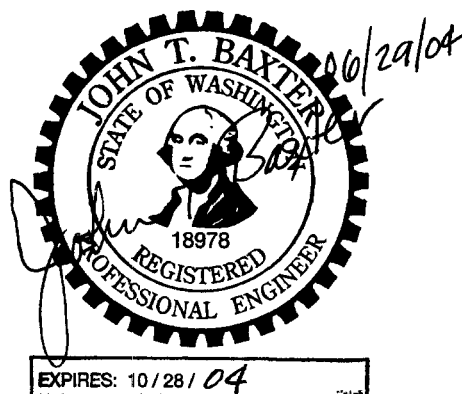
**IQRPE REVIEW -
PRETREATMENT FACILITY (PTF) CESIUM NITRIC ACID RECOVERY
PROCESS SYSTEM (CNP) VESSELS CNP-VSL-00001, CNP-VSL-00003 &
CNP-VSL-00004**

"I, John T. Baxter have reviewed, and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the Pretreatment Facility (PTF) Cesium Nitric Acid Recovery Process System (CNP) Vessels CNP-VSL-00001, CNP-VSL-00003 & CNP-VSL-00004 as required by The Dangerous Waste Regulations, namely, WAC 173-303-640(3) applicable paragraphs, i.e., (a) through (g)."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicate that the design intent fully satisfies the requirements of the WAC.

The attached review is seven (7) pages numbered one (1) through seven (7).



John T. Baxter
Signature

06/29/2004
Date

24590-CM-HC4-HX46-00138-02-00036 Rev00A

**STRUCTURAL INTEGRITY ASSESSMENT OF THE
PRETREATMENT FACILITY (PTF) CESIUM NITRIC
ACID RECOVERY PROCESS SYSTEM (CNP)
VESSELS CNP-VSL-00001, CNP-VSL-00003 &
CNP-VSL-00004**

**COGEMA-IA-061
Rev. 0**

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

**Pretreatment Facility (PTF) Cesium Nitric Acid Recovery Process System (CNP)
Vessels CNP-VSL-00001, CNP-VSL-00003 & CNP-VSL-00004**

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Scope	Scope of this Integrity Assessment	<p>The scope of this integrity assessment includes the Pretreatment Facility (PTF) Cesium Nitric Acid Recovery Process System (CNP) Vessels. The Vessels are Cesium Evaporator Eluate Lute Pot, CNP-VSL-00001; Eluate Contingency Storage Vessel, CNP-VSL-00003 and Cs Evaporator Recovered Nitric Acid Vessel, CNP-VSL-00004. The primary function of the CNP System vessels is to receive eluate from the Cesium Ion Exchange Process System (CXP) and to provide recovered eluant to the CXP system on demand.</p>
References	Drawings and Material Requisitions	<p>24590-PTF-P1-P01T-P0001, Rev. 3, Pretreatment General Arrangement Plan at EL. 0'-0"; 24590-PTF-M5-V17T-P0014, Rev. 0, Process Flow Diagram Cesium Nitric Acid Recovery Process System CNP; 24590-QL-MRB-MVA0-00003, Rev. 1, Pressure Vessels, High Alloy, Shop Fab, Small, <60" dia QL-1/2 (N112) (MS015), MR Section 2 – Technical Specifications (Rev. 5, August 19, 2003) including -S01, -S02, -S0003; 24590-QL-MRD-MVA0-00002, Rev. 2, Pressure Vessels, High Alloy, Shop Fabricated, Medium QL-1 (N116), MR Section 2 – Technical Specifications (Rev. 5, August 19, 2003) including -S0011; 24590-CM-MRB-MVA0-00002, Rev. 001, Pressure Vessels, Shop Fabricated, Medium, MR Section 2 – Technical Specifications (Rev. 3, January 6, 2003) including -S01, -S02, -S03, -S0004, -S0006, & -S0007; 24590-PTF-MV-CNP-00005, Rev. 0, Equipment Assembly Cesium Evaporator Eluate Lute Pot CNP-VSL-00001; 24590-PTF-MV-CNP-00001, Rev. 0, Equipment Assembly Eluate Contingency Storage Vessel CNP-VSL-00003; 24590-PTF-MV-CNP-00002, Rev. 0, Equipment Assembly Cs Evaporator Recovered Nitric Acid Vessel CNP-VSL-00004;</p>

Pretreatment Facility (PTF) Cesium Nitric Acid Recovery Process System (CNP) Vessels CNP-VSL-00001, CNP-VSL-00003 & CNP-VSL-00004		COGEMA-IA-061, Rev. 0

References Mechanical Data Sheets, Plant Item Material Selection Data Sheets and System Description	Mechanical Data Sheet: Vessel, 24590-PTF-MVD-CNP-P0010, Rev. 0, Cesium Evaporator Eluate Lute Pot CNP-VSL-00001; Mechanical Data Sheet: Vessel, 24590-PTF-MVD-CNP-P0003, Rev. 1, Eluate Contingency Storage Vessel CNP-VSL-00003; Mechanical Data Sheet: Vessel, 24590-PTF-MVD-CNP-P0007, Rev. 1, Cs Evaporator Recovered Nitric Acid Vessel CNP-VSL-00004; Plant Item Material Selection Data Sheet, 24590-PTF-N1D-CNP-P0011, Rev. 0, Cs Evaporator Eluate Lute Pot CNP-VSL-00001, (PTF); Plant Item Material Selection Data Sheet, 24590-PTF-N1D-CNP-P0009, Rev. 0, Eluate Contingency Storage Vessel CNP-VSL-00003 (PTF); Plant Item Material Selection Data Sheet, 24590-PTF-N1D-CNP-P0006, Rev. 1, Cs Evaporator Recovered Nitric Acid Vessel CNP-VSL-00004 (PTF); 24590-PTF-3YD-CNP-00001, Rev. 0, System Description for Cesium Nitric Acid Recovery Process – System CNP; System Description Change Notice (SDCN) No. 24590-PTF-3YN-CNP-00001 for System Description Number 24590-PTF-3YD-CNP-00001, Rev. 0

For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design controls and requirements to assure the design intent fully satisfies the WAC requirements.

Summary of Assessment

**Pretreatment Facility (PTF) Cesium Nitric Acid Recovery Process System (CNP)
Vessels CNP-VSL-00001, CNP-VSL-00003 & CNP-VSL-00004**

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Information Assessed		Source of Information	Discussion
Design	Vessel design standards are appropriate and adequate for the vessel's intended use.	<p>Drawings, Material Requisitions and Mechanical Data Sheets listed above under References;</p> <p>24590-WTP-3PS-MV00-T0001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication;</p> <p>SCN No. 24590-WTP-3PN-MV00-00006 for Spec. No. 24590-WTP-3PS-MV00-T0001, Rev. 1;</p> <p>24590-WTP-3PS-MV00-T0003, Engineering Specification for Pressure Vessel Fatigue Analysis (Rev. 1 CNP-VSL-00004, Rev. 2 CNP-VSL-00003);</p> <p>ASME Boiler and Pressure Vessel (B&PV) Code, Section VIII, Division 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers;</p> <p>ASME Boiler and Pressure Vessel (B&PV) Code, Section VIII, Division 2, Alternative Rules, American Society of Mechanical Engineers</p>	<p>The Material Requisitions require use of The Engineering Specification for Pressure Vessel Design and Fabrication for vessels CNP-VSL-00001, -00003 and -00004. This specification requires that the vessels and all vessel appurtenances are to be designed to ASME B&PV Code, Section VIII, Division 1 rules. Additional supplementary requirements are specified in the specification for Pressure Vessel Design and Fabrication. These supplementary requirements address pressure vessel fatigue analysis, positive material identification, standard fabrication tolerances, acceptable welding procedures for the vessel and appurtenances, welder qualifications and testing records, NDE inspections and records, quality assurance requirements, and packaging, shipping, handling and storage requirements. Two of the vessels have internal equipment (CNP-VSL-00003 & -00004) that is subject to cyclic loading, e.g., pulse jet mixers and charge vessels. The Engineering Specification for Pressure Vessel Fatigue Analysis requires use of the fatigue design standards in ASME B&PV Code, Section VIII, Division 2, which are appropriate for components with a high number of load cycles. The Mechanical Data Sheets identify vessels CNP-VSL-00001 & -00003 as Quality Level (QL-1) and Seismic Category (SC-I) equipment. Vessel CNP-VSL-00004 is listed as Quality Level (CM, Commercial Grade) and Seismic Category (SC-III) equipment. Quality levels and seismic categories are discussed in detail in the Engineering Specification for Pressure Vessel Design and Fabrication. These are adequate and acceptable codes and standards for design and fabrication of these CNP system vessels.</p>
	If a non-standard vessel is to be used, the design calculations demonstrate sound engineering principles of construction.	<p>24590-WTP-3PS-MV00-T0001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication;</p> <p>SCN No. 24590-WTP-3PN-MV00-00006 for Spec. No. 24590-WTP-3PS-MV00-T0001, Rev. 1;</p> <p>ASME Boiler and Pressure Vessel (B&PV) Code, Section VIII, Division 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers</p>	<p>The Engineering Specification for Pressure Vessel Design and Fabrication require that the CNP system vessels are to be designed and fabricated in accordance with the requirements of ASME B&PV Code, Section VIII, Division 1. The vessels are to be delivered after design, fabrication, inspection and testing with an ASME code stamp and the vessels will be registered with the National Board. These are shop fabricated vessels for mixed waste service in the PTF. The vessel design standards are appropriate and adequate for the vessels' intended uses.</p>

Pretreatment Facility (PTF) Cesium Nitric Acid Recovery Process System (CNP) Vessels CNP-VSL-00001, CNP-VSL-00003 & CNP-VSL-00004			COGEMA-IA-061, Rev. 0	
Information Assessed		Source of Information	Discussion	
Design	<p>Vessel has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.</p>	<p>Drawings, Material Requisitions and Mechanical Data Sheets listed above under References; 24590-WTP-3PS-MV00-T0001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; SCN No. 24590-WTP-3PN-MV00-00006 for Spec. No. 24590-WTP-3PS-MV00-T0001, Rev. 1; 24590-WTP-3PS-MV00-T0002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-SS90-T0001, Rev. 0, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks; 24590-WTP-3PS-FB01-T0001, Rev. 1, Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks; UBC, 1997, Uniform Building Code, International Conference of Building Officials</p>	<p>The Engineering Specification for Pressure Vessel Design and Fabrication requires that the CNP vessels are to be designed to ASME B&PV Code, Section VIII, Division 1 rules. This code requires specific consideration of the operating pressures, temperatures, seismic loads, and corrosion allowance in the design process. Supplementary general design criteria are specified in the Engineering Specification for Seismic Qualification Criteria for Pressure Vessels. The Mechanical Data Sheets identify the operating pressure and temperature ranges for each vessel, the materials selected in the corrosion report, the corrosion allowance, and the requirements for seismic qualification in the design. The Mechanical Data Sheets indicate that vessels CNP-VSL-00001 & -00003 are to be analyzed as SC-I vessels. The Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks provides detailed guidance for the seismic analyses. The Mechanical Data Sheet indicates that CNP-VSL-00004 is to be analyzed as a SC-III vessel. The Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks provides detailed guidance for this seismic analysis which requires use of the seismic design requirements in the 1997 UBC. These are appropriate codes and standards to ensure the tanks have adequate strength at the end of their design lives.</p>	
	<p>Vessel foundation will maintain the load of a full vessel.</p> <p>If in an area subject to flooding, the vessel is anchored.</p>	<p>Drawings listed above under References; 24590-WTP-3PS-MV00-T0001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; SCN No. 24590-WTP-3PN-MV00-00006 for Spec. No. 24590-WTP-3PS-MV00-T0001, Rev. 1; 24590-WTP-3PS-MV00-T0001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; SCN No. 24590-WTP-3PN-MV00-00006 for Spec. No. 24590-WTP-3PS-MV00-T0001, Rev. 1;</p>	<p>The Equipment Assembly drawings show the support arrangements for the CNP system vessels. All of the vessels are provided with cylindrical skirts with a ring beam to provide for bearing on concrete or support rings and anchorage. The Engineering Specification for Pressure Vessel Design and Fabrication requirements assure adequate vessel foundation designs.</p> <p>Buoyant forces of an empty vessel in a flooded room are a mandatory standard design load case in the Engineering Specification for Pressure Vessel Design and Fabrication.</p>	

Pretreatment Facility (PTF) Cesium Nitric Acid Recovery Process System (CNP) Vessels CNP-VSL-00001, CNP-VSL-00003 & CNP-VSL-00004				COGEMA-IA-061, Rev. 0
Information Assessed		Source of Information		Discussion
Frost Heave	Vessel system will withstand the effects of frost heave.	Drawings and System Description listed above under References 24590-WTP-DC-ST-01-001, Rev. 2, Structural Design Criteria	The PTF General Arrangement Plan at elevation 0'-0" shows that vessels CNP-VSL-00001, -00003 and -00004 are installed in inaccessible process cells. These cells are supported by the PTF mat foundation. The Structural Design Criteria requires that all structural foundations extend into the surrounding soil below the frost line in order to preclude frost heave. The frost line is located 30 in. below finished grade. The PTF mat foundation is not subject to frost heave; therefore, the CNP system vessels will not be subject to frost heave.	
Waste Characteristics	Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, storage temperature)	Drawings and System Description listed above under References; 24590-WTP-PER-PR-03-002, Rev. 1, Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Treatment Unit System; 24590-WTP-PER-PR-03-001, Rev. 1, Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems	The System Description identifies that vessels CNP-VSL-00001 & -00004 receive eluate from the Cesium Ion Exchange Process System (CXP) and recovered nitric acid eluate feed from the Cesium Evaporator Nitric Acid Rectifier respectively. The eluate and the recovered nitric acid eluate feed are both about 0.5 M HNO ₃ aqueous solutions. The eluate contains the cesium that has been separated from the Low-Activity Waste feed. The primary function of these vessels is to provide primary confinement of the waste during normal operation, abnormal operations and during and after a design level seismic event. These vessels are not a concern for hydrogen control. Vessel CNP-VSL-00003, the Eluate Contingency Storage Vessel, functions as a receiver vessel for both normal and abnormal operations in the CNP system. It can receive the Cesium concentrate from the Cesium Evaporator Separator Vessel to provide lag storage for normal operations. This vessel can also receive eluate directly from the CXP system during abnormal operations. This vessel provides primary confinement of the waste during normal operations, abnormal operations, and during and after a Design Basis Earthquake. It must also maintain an intact connection to the hydrogen purge system during these same conditions as discussed in the Prevention of Hydrogen Accumulation in WTP Tank Systems document. The process flow diagram shows that all of the CNP system vessels connect to the Pretreatment Vessel Vent Process System for control of aerosols and offgas vapors as discussed in the Toxic Vapors and Emissions from WTP Tank Systems document.	

**Pretreatment Facility (PTF) Cesium Nitric Acid Recovery Process System (CNP)
Vessels CNP-VSL-00001, CNP-VSL-00003 & CNP-VSL-00004**

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Information Assessed		Source of Information	Discussion
Waste Characteristics	Vessel is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.	Mechanical Data Sheets, Plant Item Material Selection Data Sheets and System Description listed above under References	The Plant Item Material Selection Data Sheets show that the materials selected for vessels CNP-VSL-00001, -00003 and -00004 take into account the ranges of waste chemistries that will be received in each vessel. Additional reagents are not added to these vessels during normal operations. The Mechanical Data Sheets list 304 stainless steel (maximum 0.030% Carbon, dual certified), hereinafter referred to as 304L stainless steel as the material selected for CNP-VSL-00001 & -00004. A somewhat more resistant alloy, 316 stainless steel (maximum 0.030% Carbon, dual certified), hereinafter referred to as 316L stainless steel, was selected for CNP-VSL-00003.
	The waste types are compatible with each other.	Plant Item Material Selection Data Sheets and System Description listed above under References	The CNP System Description document discusses wastes received in each of the CNP vessels during normal and abnormal operations. Waste chemistries were considered in the Plant Item Material Selection Data Sheets for each of the CNP vessels. Incompatible wastes are not mixed in any of the CNP system vessels.
	Vessel material and protective coatings ensure the vessel structure is adequately protected from the corrosive effects of the waste stream and external environments (expected to not leak or fail for the design life of the system)	Mechanical Data Sheets, Plant Item Material Selection Data Sheets and System Description listed above under References	The Plant Item Material Selection Data Sheets show that 304L stainless steel was selected for CNP-VSL-00001 & -00004 as adequate for internal corrosion for a 40 year service life. The Plant Item Material Selection Data Sheet for CNP-VSL-00003 shows that 316L stainless steel was selected as adequate for internal corrosion for an expected 40 year service life. These material selections are correctly carried forward to the Mechanical Data Sheets for these vessels. All of the CNP vessels are located inside inaccessible process cells in the PTF. These cells normally operate in dry conditions with active ventilation, therefore, external corrosion will be very limited. The materials selected are adequate to provide the required 40 year service life for these vessels.

**Pretreatment Facility (PTF) Cesium Nitric Acid Recovery Process System (CNP)
Vessels CNP-VSL-00001, CNP-VSL-00003 & CNP-VSL-00004**

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Information Assessed	Source of Information	Discussion
Corrosion Allowance Corrosion allowance is adequate for the intended service life of the vessel.	Drawings, Mechanical Data Sheets and Plant Item Material Selection Data Sheets listed above under References	The Plant Item Material Selection Data Sheets show that 304L stainless steel was selected for CNP-VSL-00001 & -00004 as adequate with a corrosion allowance of 0.040 in. for internal corrosion for a 40 year service life. The Plant Item Material Selection Data Sheet for CNP-VSL-00003 shows that 316L stainless steel was selected as adequate with a corrosion allowance of 0.040 in. for internal corrosion for an expected 40 year service life. The material selections and corrosion allowances are accurately carried forward to the Mechanical Data Sheets. These material selections and corrosion allowances assure an adequate service life for the vessels.
Pressure Controls Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the vessel are exceeded.	Drawings and System Description listed above under References	The Process Flow Diagram shows that CNP-VSL-00003 & -00004 overflow to vessel PWD-VSL-00033 located at elevation (-) 45'-0" in the PTF. Vessel CNP-VSL-00001 normally operates in a full condition overflowing to CNP-EVAP-00001 as part of the gravity feed system for the evaporator. as discussed in the System Description. The Equipment Assembly drawings show that the overflow lines are larger than any of the other liquid conveying lines entering the vessels and therefore have adequate flow capacity to preclude overpressure for CNP-VSL-00003 & -00004.